ASTHMA PROVIDER MANUAL

Pediatric

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Clinical Guidelines: Stepwise Approach for Managing Asthma

The aim of asthma therapy is to maintain control of asthma with the least amount of medication and hence minimal risk for adverse effects. Control of asthma is defined as:

- Preventing chronic and troublesome symptoms (e.g., coughing or breathlessness in the night, in the early morning, or after exertion)
- Maintaining (near) "normal" pulmonary function
- Maintaining normal activity levels (including exercise and other physical activity)
- Preventing recurrent exacerbations of asthma and minimizing the need for emergency department visits or hospitalizations
- Providing optimal pharmacotherapy with minimal or no adverse effects
- Meeting patients' and families' expectations of and satisfaction with asthma care

The stepwise approach to therapy, in which the dose and number of medications and frequency of administration are increased as necessary and decreased when possible, is used to achieve this control. Because asthma is a chronic inflammatory disorder of the airways with recurrent exacerbations, therapy for persistent asthma must emphasize efforts to suppress inflammation over the long term and prevent exacerbations. Recommendations in the stepwise approach to therapy are based on the National Asthma Education and Prevention Program Expert Panel's review of the literature and the Expert Panel's experience and opinion.

Stepwise Approach for Managing Infants and Young Children (5 years of Age and Younger) With Acute or Chronic Asthma

Classify Severity: Clinical Features Before Tratment or Adequate Control		Medications Required to Maintain Long-Term Control
	Symptoms/Day Symptoms/Night	Daily Medications
Step 4 Severe Persistent	Continual Frequent	**Preferred treatment:** **-High-dose inhaled corticosteroids** **AND** **-Long-acting inhaled beta$_2$-aganists** **AND,** if needed, Corticosteroid tablets or syrup long term (2mg/kg/day. generally do not exceed 60 mg per day). (Make repeat attempts to reduce systemic corticosteroids and maitain control with high-dose inhaled corticosteroids.)
Step 3 Moderate Persistent	Daily > 1night/week	**Preferred treatments:** **Low-dose inhaled corticosteroids and long-acting inhaled beta$_2$-agaonists** **OR Medium-dose inhaled corticosteroids.** Aternative treatment: -Low-dose inhlaed corticosteroids and either leukotriene receptor antagoinist or theophylline. If needed (particularyly in patients with recurring severe exacerbations): **Preferred treament:** **-Medium-dose inhaled coritcosteroids and long-acting beta$_2$-agonists.** Alternative treatment: Medium-dose inhaled corticosteroids and either leukotriene receptor antagonist or theophylline.
Step 2 Mild Persistent	>2/week but< 1x/day > 2 nights/month	**Preferred treatment:** **-Low-dose inhaled corticosteroids (with nebulizer or MDI with holding chamber with or without face mask or DPI.)** Alternative treatment (listed alphabetically): Cromolyn (nebulizer is preferred or MDI with holding chamber) OR leukotriene receptor antagonist.
Step 1 Mild Intermittent	≤2 days/week ≤ 2 nights/month	No daily medication needed.

Stepwise Approach for Managing Infants and Young Children (5 years of Age and Younger) With Acute or Chronic Asthma

Step Down
Review treatment every 1 to 6 months; a gradual stepwise reduction in treatment may be possible.

Step Up
If control is not maintained, consider step up. First, review patient medication technique, adherence, and environmental control

Quick Relief

All Patients

Bronchodilator as needed for symptoms. Intensity of treatment will depend upon severity of exacerbation.

- Preferred treatment: Short-acting inhaled beta$_2$-agonists by nebulizer or face mask and space/holding chamber
- Alternative treatment: Oral beta$_2$-agonist
- With vital respiratory infection: Bronchodilator every 4-6 hours up to 24 hours (longer with physician consult); in general, repeat no more than once every 6 weeks.
- Consider systemic corticosteroid if exacerbations severe or patient has history of previous severe exacerbations.

Use of short-acting beta2-agonists>2 times a week in intermittent asthma daily, or increasing use in persistent asthma) may indicate the need to initiate (increase) long-term -control therapy.

Goals of Therapy: Asthma Control

- Minimal or no chronic symptoms day or night
- Minimal or no exacerbations
- No limitations on activities; no school/parent's work missed
- Minimal use of short-acting inhaled beta$_2$ agonist
- Minimal or no advers effects from medications

Note

- The stepwise approach is intended to assist, not replace, the clinical decision making required to meet individual patient needs.
- Classify severity: assign patient to most severe step in which any feature occurs.
- There are very few sttudies on asthma therapy for infants.
- Gain control as quickly as possible (a course of short systemic corticosteroids may be required); then step down to the least medication necessary to maintain control.
- Minimize use of short-acting inhaled beta$_2$-agonists. Overreliance on short-acting inhaled beta$_2$-agonists (e.g., use of approximately one canister a month even if not using it every day) indicates inadequate control of asthma and the need to initiate or intensify long-term-control therapy.
- Provide parent education on asthma mangement and controlling environmental factors that make asthma worse (e.g., allergies and irritants).
- Consultation with an asthma specialist is recommended for patients with moderate or severe persistent asthma. Consider consultation for patients with mild persistent asthma.

Stepwise Approach for Managing Asthma in Adults and Children Older Than 5 Years of Age: Treatment

Classify Severity: Clinical Features Before Tratment or Adequate Control			Medications Required to Maintain Long-Term Control
	Symptoms/Day Symptoms/Night	PEF or FEV PEF Variability	Daily Medications
Step 4 Severe Persistent	Continual Frequent	≤ 60% > 30%	**Preferred treatment:** -High-dose inhaled coricosteroids **AND** -Long-acting inhaled beta$_2$-agonists **AND, if needed,** Corticosteroid tablets or syrup long term 12 mg/kg/day, generally do not exceed 60 mg/per/day). Make repeat attempts to reduce systemic corticosteroids and maintain control with high-dose inhaled corticosteroids.
Step 3 Moderate Persistent	Daily > 1night/week	> 60%- < 80% > 30%	**Preferred Treatment:** -Low-to-medium dose inhaled corticosteroids **AND** -Long-acting inhaled beta$_2$-agonists. **Alternate treatment (listed alphabetically):** -Increase inhaled corticosteroids within medium-dose range, **OR** low-to-medium dose inhaled corticosteroids and either leukotriene modifier or theophylline. If needed (particulary in patients with recurring severe exacerbations): **Preferred treatment:** **-Increased inhaled corticosteroids within medium-dose rance and add long-acting inhaled beta$_2$-agonists.** **-Alternative treament (listed alphabetically):** -Increase inhaled corticosteroids with medium-dose range and add either leukotriene modifier or theophylline.
Step 2 Mild Persistent	>2/week but< 1x/day > 2 nights/month	≥80% 20-30%	**Preferred treatment:** -Low-dose inhaled corticosteroids. **Alternative treatment (listed alphabetically):** Cromolyn, leukotriene modifier, nedocromil, **OR** sustained-release theophylline to serum concentration of 5-15 mcg/mL.
Step 1 Mild Intermittent	≤2 days/week ≤ 2 nights/month	≥80% < 20%	No daily medication needed. Severe exacerbation may occur, separated by long peroids of normal lung function and no symptoms. A course of systemic corticosteroids is recommended.

Stepwise Approach for Managing Asthma in Adults and Children Older Than 5 years of Age: Treatment

Step Down
Review treatment every 1 to 6 months; a gradual stepwise reduction in treatment may be possible.

Step Up
If control is not maintained, consider step up. First, review patient medication technique, adherence, and environmental control.

Quick Relief
All Patients

- Short-acting bronchodilator:2-4 puffs short-acting inhaled beta$_2$-agonists as needed for symptoms.
- Intensity of treatment will depend on severity of exacerbation; up to 3 treatments at 20 minute intervals or a single nedbulizer treatment as needed. Course of systemic corticosteroids may be needed.
- Use of short-acting beta$_2$-agonists >2 times a week in intermittent asthma (daily, or increasing use in persistent asthma) may indicate the need to initiate (increase) long-term-control therapy.

Goals of Therapy: Asthma Control

- Minimal or no chronic symptoms day or night
- Minimal or no exacerbations
- No limitations on activities; no school/parent's work missed
- Minimal use of short-acting inhaled beta$_2$ agonist
- Minimal or no adverse effects from medications

Note

- The stepwise approach is intended to assist, not replace, the clinical decision making required to meet individual patient needs.
- Classify severity: assign patient to most severe step in which any feature occurs (PEF is % of personal best; FEV_1 is % predicted).
- Gain control as quickly as possible (consider a short course of systemic corticosteroids); then step down to the least medication necessary to maintain control.
- Minimize use of short-acting inhaled beta$_2$-agonists. Overreliance on short-acting inhaled indicates inadequate control of asthma not the need to initiate or intesify long-term-control therapy.
- Provide education on self-mangement and controlling environmental factors that make asthma worse (e.g., allergens and irritants).
- Refer to an asthma specialist if there are difficulties controlling asthma.

Usual Dosages for Long-Term-Control Medications

Medication	Dosage Form	Adult Dose	Child Dose*
Inhaled Corticosteroids ***(See estimated Comparative Daily Dosages for Inahled Corticoteroids.)***			
Systemic Corticosteroids ***(Applies to all three corticosteroids)***			
Methylprednisolone	2, 4, 8, 16, 32 mg tablets	• 7.5-60 mg daily in a single dose in a.m or qod as needed for control •Short-course "burst" to achieve control: 40-60 mg per day as as single or 2 divided doses for 3-10 days	0.25 mg/kg daily in a single dose in a.m or qod as needed for control • Short-course "burst": 1-2 mg/kg/day, maximum 60 mg/day for 3-10 days
Prednisolone	5 mg tablets 5mg/5cc, 15mg/5cc		
Prednisone	1, 2.5, 5, 10, 20, 50 mg tablets 5 mg/cc, 5 mg/ 5 cc		
Long-Acting Inhaled Beta$_2$-Agonists ***(Should not be used for symptom relief or for exacerbations use with inahled corticosteroids and should not be prescribed a single agend, only in combo with ICS).***			
Salmeterol	MDI 21 mcg/puff	2 puffs q 12 hours	1-2 puffs q 12 hours
	DPI 50 mcg/blister	1 blister q 12 hours	1 blister q 12 hours
Formoterol	DPI 12 mcg/single-use capsule	1 capsule q 12 hours	1 capsule q 12 hours
Combined Medication			
Fluticasone/ Salmeterol	DPI 100, 250 or 500 mcg/ 50 mcg	1 inhalation bid; dose depends on severity of asthma	1 inhalation bid; depends on severity of asthma
Cromolyn and Nedocromil			
Cromolyn	MDI 1 mg/puff	2-4 puffs tid-qid	1-2 puffs tid-qid
	Nebulizer 20 mg/ampule	1 ampule tid-qid	1 ampule tid-qid
Nedocromil	MDI 1.75 mg/puff	2-4 puffs bid-qid	1-2 puffs bid-qid
Leukotriene Modifiers			
Montelukast	4 or 5 mg chewable tablet 10 mg tablet	10 mg qhs	4mg qhs (2-5 yrs) 5 mg qhs (6-14 yrs) 10 mg qhs (> 14 yrs)
Zafirlukast	10 or 20 mg tablet	40 mg daily (20mg bid)	20mg daily qhs (>14 yrs)
Zileuton	300 or 600 mg tablet	2,400 mg daily (give qid)	Liver function monitoring necessary
Methylzanthines ***(Serum monitoring is important ([serum concentration of 5-15 mcg/mL at steady state]).***			
Theophylline	Liquids, sustained-release tablet, and capsules	Starting dose 10 mg/kg/day up to 300 mg max; usual max 800 mg/day	Starting dose 10 mg/kg/day usual max: < 1 yr of age: 0.2 (age in weeks) +5 = mg/kg/day ≥1 yr of age: 16 mg/kg/day

Estimated Compartative Daily Dosages for Inhaled Corticosteroids

Drug	Low Daily Dose		Medium Daily Dose		High Daily Dose	
	Adult	Child*	Adult	Child*	Adult	Child*
Beclomethasone CFC 42 or 84 mcg/puff	168- 504 mcg	84- 336 mcg	504- 840 mcg	336- 672 mcg	>840mcg	>672 mcg
Beclomethasone HFA 40 or 80 mcg/puff	80- 40 mcg	80- 160 mcg	240- 480 mcg	160- 320 mcg	> 480 mcg	> 320 mcg
Budesonide DPI 200 mcg/inhalation Inhalation suspensin for nebulization (child dose)	200- 600 mcg	200- 400 mcg 0.5 mg	600- 1,000 mcg	400- 800 mcg 1.0 mg	>1,200	>800 mcg 2.0 mg
Flunisolide CFC 250 mcg/puff	500- 1,000mcg	500- 750 mcg	1,000- 2,000 mcg	1,000- 1,250 mcg	> 2,000 mcg	> 1,250 mcg
Fluticasone **HFA:** 44, 110, or 220 mcg/puff **DPI:** 50, 100, 250 mcg/ inhalation	88- 264 mcg 100- 300mcg	88- 176 mcg 100- 200 mcg	264- 660 mcg 300- 600 mcg	176- 440 mcg 200- 400 mcg	> 600 mcg > 600 mcg	>440 mcg >400 mcg
Triamcinolone acetonide CFC 100 mcg/puff	400- 1,000 mcg	400- 800 mcg	1,000- 2,000 mcg	800- 1,200 mcg	>2,000 mcg	1,2000 mcg

Asthma

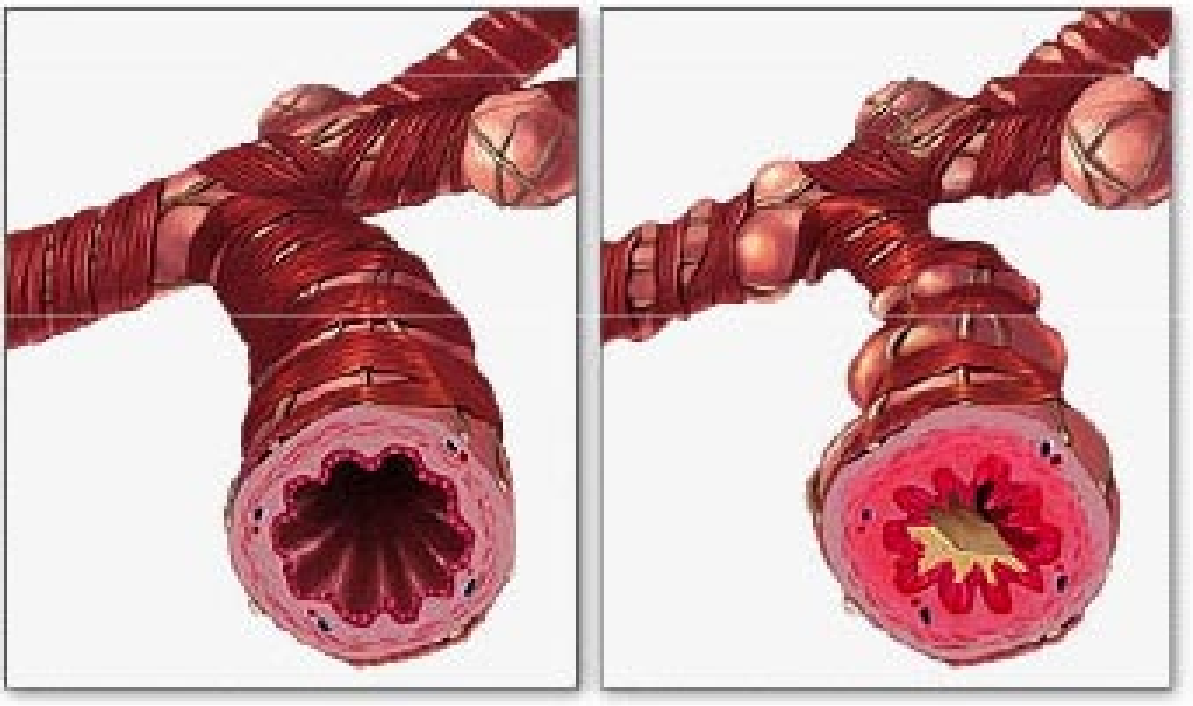
Key Points

- Asthma is a chronic inflammatory disease that can have many triggers.
- Uncontrolled asthma has a significant impact on daily activities.
- 5% of Utah children under 18 years of age are receiving medical treatment for Asthma.
- Poorly controlled asthma is expensive in both direct and indirect costs.

Asthma is a chronic inflammatory disease of the airways causing: airflow limitation, and airway hyper-responsiveness respiratory symptoms (wheeze, cough, shortness of breath, chest tightness). The three components of asthma are: increased mucous production, inflammation of airways, and smooth muscle tightening.

Normal Bronchiole

Asthmatic Bronchiole



Asthma controller therapy is focused on reducing the inflammation in the airways, and rescue medication helps relax the smooth muscles. Bronchodilators do not have an effect on reducing airway inflammation.

Asthma symptoms are often "triggered" by:

- environmental stimuli (smoke, dust mites, animals, fungi/molds, cold air)
- aggravating conditions (viral upper respiratory infections [URIs], rhinitis, sinusitis, gastroesophageal reflux, stress, exercise).

Asthma is episodic in nature and usually reversible. With persistent symptoms, the chronic inflammation may contribute to airway remodeling and the resulting morphologic changes may not be completely reversible.

Prevalence

In 2002, the National Center for Health Statistics asked individuals if they had ever been diagnosed with asthma by a health professional. For children aged 0-17, 122 per 1,000 children (1 out of 8 representing 8.9 million children in the US) said yes. The same survey found 83 per 1,000 (1 in 12) children currently had asthma symptoms. [CDC: 2002]

The 2001 Utah Health Status Survey [McNamara: 2005] found 5% of Utah children under 18 years of age were receiving medical care for asthma. The percentage was slightly higher for males (5.6%) than for females (4.3%). Utah data from the 2003 Youth Tobacco Survey found the prevalence of asthma among middle school children to be about 14.8% and about 19.2% in high school students. [Agraz,: 2004].

Morbidity - Asthma, especially if uncontrolled, is expensive in both direct and in indirect costs. [Lenney: 1997] [Mielck: 1996]

Direct Costs - Annual US costs of treating pediatric asthma are estimated to be $1.9 billion:

- Over 8.7 million prescriptions
- 3,537,000 doctor visits
- 658,000 emergency department visits for children under 15 years of age
- 190,000 hospitalizations.

Indirect Costs - Annual indirect costs of asthma include:

- 60% of school absences, children with severe asthma may miss > 30 school days
- Lost productivity among parents/caregivers estimated to be more than $1 billion
- Disturbed sleep from asthma reduces productivity in caregivers and children

Therapy

Key Points

- The diagnosis of asthma is based on the presence of episodic symptoms of airflow obstruction and airflow limitation that is at least partially reversible.
- Current and passed medical history may help with diagnosis and reassessment.
- Spirometry of the 'gold standard' for measuring lung function
- Classifying severity is essential to guiding treatment and assessing progress.

Clinical Assessment

The following is based on guidelines developed by the National Asthma Education and Prevention Program (NAEPP), in cooperation with the National Heart, Lung, and Blood Institute (NHLBI).
They identified the following assessment components as essential to quality asthma care: [Williams: 2003]

- Establish a diagnosis
- Classify severity
- Assess for referral to asthma specialist

Ongoing assessment and modification of management is critical to maintaining high quality of care for patients with asthma. The following will combine aspects of initial and ongoing assessment.

Establishing a Diagnosis and Periodic Assessment

The diagnosis of asthma is based on the presence of episodic symptoms of airflow obstruction and airflow limitation that is at least partially reversible. Confirmation of clinical suspicion of asthma with objective measures of pulmonary function is recommended whenever possible.

Note that the diagnosis of asthma in infants and small children is primarily based on clinical judgment and/or response to asthma treatment because of the lack of reliable objective measures of lung function particularly in children under 5 years of age:

- Wheezing does not always mean asthma.
- Asthma may be present without wheeze
- Young children (< age 6) may wheeze when they have upper respiratory infections,
- In infants with no indications of allergy, wheezing tends to lessen or disappear in the preschool years,
- Recurrent episodes of cough with or without wheeze are almost always due to asthma.

Family and Patient History

Pregnancy/Perinatal History: other than genetics, prenatal history is not helpful in the diagnosis of asthma. Babies born prematurely and who have significant respiratory complications, particularly the need for mechanical ventilation and prolonged supplemental oxygen are at increased risk for subsequent reactive airways disease. This may differ in some ways from typical asthma, but is generally assessed the same way.

Family History: A family history of atopy, asthma, allergies and/or eczema (atopic conditions) increases the likelihood of asthma.

Current and Past Medical History: (each component may help with diagnosis and reassessment)

Presence of symptoms

- Coughing and/or wheezing
- shortness of breath or rapid breathing
- chest tightness

Pattern of symptoms including onset, duration, and frequency:

- Perennial, seasonal or both
- Continual, episodic or both
- Diurnal variations (symptoms that occur/worsen at night)
- Exercise-induced cough or shortness of breath

Precipitating or aggravating factors (triggers):

- viral infections
- exposure to tobacco smoke, wood smoke
- exposure to environmental irritants, aerosol chemicals, and allergens
- indoor allergens: [See the EPA's home environment checklist in Patient Education]
- age and location of home
- cooling/heating system, wood-burning stove or fireplace
- humidity, evidence of mold or mildew
- floor coverings, carpeting, materials such as upholstered furniture, bedding
- exposure to secondhand smoke
- toys found in child's room, exposure to pets
- for outdoor allergens
- seasonality of symptoms
- specific known triggers (horses, Russian olive, etc.)
- exercise, crying, laughing, or emotional excitement
- changes in weather, increased pollen count
- drugs (aspirin, beta-blockers)

Particularly for infants:

- difficulty eating (grunting, poor sucking), weight loss, poor appetite
- irritability, lethargy, changes in sleep patterns
- increased respiratory rate, retractions

For the older child:

- fatigue, complaints of not feeling well, not sleeping well
- poor school performance
- decrease, avoidance of activities

Interim history

- Have symptoms been better or worse?
- Has the child needed to visit the ER or come in for an unscheduled visit?
- Has the child missed school or other activities?
- Have the parents missed work because of the child's symptoms?
- Has there been one or more exacerbations of symptoms? Were triggers identified? describe symptoms over the past two weeks
- check the Peak Flow ratings (check patient's technique for measuring the Peak Flow)
- check current medications, their use (and compare with the last asthma management plan), side effects or other problems (check MDI and/or spacer technique)
- How do the parents and patient feel the management plan is working?

Assessing the Level of Control Where good control is defined as:

No coughing	Normal activities
No difficulty breathing	No absences (for parent and child)
No waking at night	Normal or near normal lung function
No acute episodes	

Physical Exam

(Note wheezing does not always indicate asthma and absence of wheezing does not rule-out asthma) [Martinez: 1995]

- **Blood Pressure** - if current asthma symptoms, evaluate for pulsus paradoxus. [Frey: 2001] [Clark: 2004]
- **HEENT** - Look for evidence of respiratory allergy (periorbital swelling, conjunctival injection or swelling, nasal stuffiness or clear discharge, pale or swollen nasal turbinates, Denny's line, mouth breathing); sinusitis; otitis media or effusion.
- **Chest** - tachypnea; hyperexpansion of the thorax; accessory muscle use; expiratory wheezing with or without forced expiration; prolonged forced exhalation (increased I:E ratio).
- **Abdomen** - exaggerated abdominal movement with respiration (seesaw breathing), particularly in young children.
- **Skin** - atopic dermatitis or eczema.

Differential Diagnosis - the following conditions may mimic asthma and should be considered whenever the diagnosis is in question:

- Any condition obstructing the upper and lower airways
- Bronchitis
- Pneumonia/ bronchiolitis
- Tumor/ neoplasm
- Pulmonary embolism
- Vocal cord dysfunction
- Viral lower respiratory tract infection
- Foreign body in the airway
- Gastroesophageal reflux (especially with aspiration)

Radiology/Laboratory/Pulmonary Function Testing

Laboratory Testing routine laboratory testing is not indicated. In acute asthma or a prolonged episode, assessment of oxygen saturation, pCO2, and/or base excess may be warranted.

Pulmonary Function Testing

Spirometry is the 'gold standard' for measuring lung function. However, it is only useful for children who can perform the test (generally over the age of five). Measurements are generally made "before and after"

- before and 15-20 minutes after inhalation of a short-acting bronchodilator or
- before and after receiving a short (2-3 week) course of oral corticosteroids
- bronchoprovocation with histamine, methacholine, or exercise

In children with asthma, these measurements should demonstrate significant reversibility: 12% or 200mL increase (decrease with bronchoprovocation) in forced expiratory volume in 1 second (FEV1). Airflow obstruction is indicated by reduced FEV 1 and FEV 1 /FVC values relative to reference values.
Diffusion Capacity testing is rarely indicated in childhood asthma, but may be useful to rule out co-existing obstructive or restrictive disease.

Peak Expiratory Flow (PEF) is useful when spirometry is normal but symptoms are present, when severity of disease is unknown, or to guide treatment and family awareness of disease. PEF measures only large airway function and lacks the diagnostic sensitivity of spirometry. Nevertheless, it is quick, easy, and inexpensive and, with practice, can be a sufficiently reliable indicator of airway function to be used to guide daily therapy or in-office assessment. Monitoring diurnal variations in PEF at home may assist in the differential diagnosis of asthma.

Imaging chest x-rays may be useful when there is consideration of other diagnoses (e.g. aspirated foreign body, tracheal ring, pneumonia, congestive heart failure), but otherwise should not be relied upon to make or rule out a diagnosis of asthma. Findings associated with asthma include: hyperaeration, flattened diaphragms, bronchiolar thickening. Sinus radiology (CT being the most specific) may be helpful is sinusitis, particularly chronic, is suspected.

Allergy Testing may be very helpful to confirm allergies as a trigger, as a cause of related symptoms, or to guide avoidance or immunotherapy.

Classify Severity

Classifying Severity is essential to guiding treatment and assessing progress. Assessing severity can be challenging in infants and young children.

It is Important to Note: Several studies have demonstrated that patients with even mild asthma are at risk for sudden death from asthma. Asthma severity is separate from asthma attack severity and a person with mild intermittent asthma is almost as likely to have a fatal asthma attack as someone with severe persistent asthma. [Robertson: 1992]

Prior to start of treatment	Classify severity according to clinical features, which may overlap. Make decisions based on the most severe step in which any feature occurs
Striving towards optimal therapy	If a child is taking medication, but optimal control has not been achieved, classify severity based on clinical features
When optimal therapy is attained	Classify severity by the level of treatment needed to maintain control of symptoms

Adapted from the NHLB Guidelines for the Diagnosis and Management of Asthma, Expert Panel Report 2, NIH Publication No 97-4051, July, 1997 [Shirley: 1997]

Clinical Features Before Treatment

The presence of one of the features of severity is sufficient to place a patient in that category. An individual should be assigned to the most severe grade in which any feature occurs.

For adults and children aged > than 5 years who can use a spirometer or peak flow meter

Classification	Step	Symptoms*	Nighttime Symptoms	PEF variability (%)	FEV1 or PEF** percent predicted normal
Severe persistent	4	Continual symptoms Limited physical activity Frequent exacerbations	Frequent	> 30%	< 60%
Moderate persistent	3	Daily symptoms Daily use of inhaled short-acting beta 2-agonist Exacerbations affect activity Exacerbations > 2 times a week; may last days	> 1 per week	> 30%	>60% - <80%
Mild persistent	2	Symptoms> 2/week but < 1/day Exacerbations may affect activity	> 2 per month	20% - 30%	> 80%
Mild intermittent	1	Symptoms < 2/week Asymptomatic and normal PEF between exacerbations Exacerbations brief (from a few hours to a few days;intensity may vary)	< 2 per month	< 20%	> 80%

*Patients at any level can have mild, moderate, or severe exacerbations. Some with intermittent asthma experience severe and life threatening exacerbations separated by long period of normal lung function and no symptoms.

**Percentage predicted values for forced expiratory volume in 1 second (FEV1) and percentage of personal best for peak expiratory flow (PEF).

Treatment: Prescribe Medications According to Severity

Prior to starting treatment, classify severity according to clinical features, which may overlap, and make decisions based on the highest severity level in which any feature occurs.

The following treatment components, based on guidelines developed by the National Asthma Education and Prevention Program (NAEPP) in cooperation with the National Heart, Lung, and Blood Institute (NHLBI), are essential to quality asthma care: [Williams: 2003]

- Schedule follow-up visits
- Recommend measures to control asthma triggers
- Treat or Prevent Comorbid Conditions
- Prescribe medications according to severity
- Monitor use of B-2 agonists
- Develop a written asthma management plan
- Maximize patient education within the office visit

Schedule Follow-Up Visits

If asthma is under control:	A minimum of two times per year
If on daily therapy:	A minimum of 3-4 visits per year
If unstable:	Every 2 weeks until stabilized

Medications and Children

Treating children with asthma can be challenging. Inhalation is preferred and is often the easiest method, consider the following:

Ages 0-18 months— it is important to treat wheezing early, treat wheezing for 4-8 weeks; stop if no clear response, minimize environmental exposures, and if necessary consult or refer patient to a specialist.

<2 years old— it is recommended to administer medications with a mask, failure to do so could result in adverse effects.

Ages 3-5— inhaled medications are also preferred, some can use an MDI and spacer depending on therapeutic response, otherwise, use a face mask.

Ages 6-12— inhaled medications are preferred, MDIs, nebulizers, DPIs may all be used, patients should demonstrate proper technique when taking medications. A spacer should be recommended if patient is unable to take medications correctly. The patient should also be aware of school medication policy and have an action plan in place.

Adolescents— take into consideration the affect of medications on appearance such as height, weight, ability to exercise, acne, and menses. Counsel on smoking and exposure to secondhand smoke, discuss drug use and the need for exercise and physical activity. Look for poor treatment response or if response changes dramatically, have an action plan in place and discuss expectations of treatment and what they need and are willing to do.

For all ages groups— it is recommended from the NAEPP to begin with therapy that corresponds to the initial evaluation of severity and step up therapy until control is achieved. When the asthma is in control, "step down" to the minimum therapy needed to maintain control with minimal adverse effects,(environmental controls, lower doses, fewer doses, or different medications). Finally, choose medication and delivery devices according to the child's ability to use them. For specific guidelines and dosages for use in pediatric asthma please refer to NAEPP Guidelines Page 2 of this manual.

Monitor Use of B2-agonists

Short acting β2 agonists should not be used for long term treatment. Provide parents/child with a means to track symptoms and use of medications. There are many asthma diaries and symptoms management tools that can be used for this purpose, see patient education of the resource section of this manual. Have the patient record the following information:

- Which β2 agonist the patient is using?
- How often it is used (every week...every day...more than once a day)?
- When it is used (at bedtime....before exercise....in the middle of the night)?

Patients using more than one canister of short acting β2-agonist medications per month need to be re-evaluated. Increased use or a 'less than expected' result suggests a decrease in control of asthma symptoms. Reevaluate severity and use the stepwise approach.

Assess for Referral to Specialist

Assessing for Referral to a Pediatric Asthma Expert (pulmonologist or, for immunotherapy, an allergist) is recommended when atypical or difficult clinical situations arise [Pediatric: 2004]:

- A child experiences a life-threatening episode
- Treatment goals are not met within 3-6 months of onset
- Other conditions are complicating asthma or its diagnosis
- Additional education or therapy complications are needed
- Immunotherapy is being considered
- Child has severe persistent asthma
- Child is under age 3 and has moderate or severe persistent asthma
- Child has used long-term oral corticosteroid therapy, high-dose inhaled corticosteroid therapy, or 2 or more bursts of oral corticosteroids in 12 months

Treat or Prevent Comorbid Conditions

Key Points

- Asthma can be difficult to diagnose in young children, especially if there is other chronic conditions present
- GERD, respiratory infections, medications sensitivities, and rhinitis can contribute to worsening asthma
- Determining the severity level of the child's asthma will help establish at what level to begin pharmaceutical therapy.

Comorbid Conditions

Respiratory Infections	Upper respiratory tract infections can cause acute exacerbations of airway obstruction in children with asthma and frequently lead to unscheduled office visits or hospitalizations. [Lemanske: 2003] Annual flu vaccinations are recommended for children at high risk of complications from influenza. [Erhart: 2004]
Rhinitis/ Sinusitis	Rhinitis is an inflammation of the mucous membranes of the nose. It can be allergic, non-allergic or both. It is often associated with other chronic conditions including asthma. www.aaaai.org/ar/workingvol2/001.asp Sinusitis de defines as inflammation of on or more of the Para nasal sinuses. It is sub classified according to duration of symptoms and frequency of reoccurrence. www.aaaai.org/member/commitee_info/sinusitis_practice_parameters.stm See Physician's Resource for additional information
Gastroesophageal Reflux	In patients where symptoms of asthma and GER coexist, and in infants and toddlers with chronic vomiting or regurigitation and recurrent episodes of cough and wheezing: A three month trial of vigorous acid suppressant therapy of GER is recommended. In patients with persistent asthma without symptoms of GER esophageal pH monitoring is recommended in selected patients. See Physician's Resource Section of this Manual for additional information www.naspghan.org/sub/position_papers/GERD.pdf
Medication Sensitivities	Aspirin-induced asthma (AIA) is a distinct clinical entity. The development of AIA does not depend on a person having had previous exposure to asprin or NSAIDs(non-steroidal andit-inflammatory drugs). Asprin-sensitive individuals mmay also be sensitive to paracetamol at high dose. Asprin should not be used in children under 16 year with febril illness because of Reye's syndrome. Paracatamol and ibuprofen appear safe in most children, with no convincing evidence that either is more effective or harmful. See Physician's Resource Section of this Manual for additional information

Successful Management Tools

Key Points

- An Asthma Management Plan includes all daily medications, follow-up information, flu vaccination reminders, and other important information; An Asthma Action Plan is a document that includes what the patient should do if he/she is experiencing worsening symptoms, when to call the doctor, and when to seek emergency care.
- Educating the child and family about their asthma is a critical component to asthma management.
- Trigger avoidance is one of the most significant activities the patient can do to improve their asthma.

Develop a Written Management and Action Plans

An **Asthma Management Plan** (AMP) is a written plan that clarifies therapy goals, outlines the monitoring and treatment of symptoms, and identifies follow-up care. It should include a daily management plan that describes routine medications and what needs to be done to keep symptoms under control. It may include self-monitoring tools such as a diary for recording symptoms, PEF measurements, and use of short-acting bronchodilators. See PTed.

A Patient Action Plan evaluates symptoms and describes actions to take when symptoms worsen. Copies of the Action Plan should be available to all care providers, teachers, coaches, school nurses, etc.

- Medications to take for worsening symptoms
- Criteria for contacting a physician
- Criteria for going to the emergency room
- Emergency contact information

Patient Education in the Office

Before you begin, remember that education should be provided to ALL relevant caregivers. Be sure to review Special Considerations for Educating Children. Your staff should reinforce your educational messages. When available, consider referring patients to a formal education program, a list of programs is located in the Physician's Resource Section of this Manual.

Tips for Educating in Time Constraints of Visit

1. Break assessment and education needs into single components over scheduled visits.
   - Basic asthma facts
   - The role of medications (long-term control and quick relief)
   - Action Plans, how they work, when to take rescue measures
   - Identifying triggers and controlling the environment
   - Use of devices and monitoring skills
   - Developing a plan for school, sports, activities

2. Have educational handouts or material on hand from Patient Education.

3. Consider using a variety of resources including videos and websites

4. Train nurses or other staff to teach MDI, spacer, PEF techniques and to assess the patient/parent performance

5. Keep a checklist of education delivered

Ask Parents to:

- Fill out (mail in or bring) a weekly diary and self-assessment form prior to the office visit.
- Bring a written list of questions or concerns so that they can be addressed during the visit.
- Bring medications, action plan and devices (inhaler, spacer, peak flow meter) to every visit. This allows you to review medications, action plan, and assess their performance using devices.
- Complete appropriate education modules/exercises at home between visits.

Patient Education Materials

Assessing Educational Needs of patient and family is critical in the successful management of asthma. The Asthma Initiative of Michigan (AIM) has developed a Guide to Asthma Education During Patient Visits, it can help you organize your approach to educating patients and families. It is also, helpful to keep in mind special considerations when educating children. More information can be found in the Physician's Resource Section of this manual.

- Listed below are resource tools that can be used for patient education in the office, they are included in the Patient Education section of this manual.

Understanding Asthma

What is Asthma?
A two page document by the American Academy of Allergy Asthma and Immunology for patients and families.

How to Help Your Child with Allergies and Asthma
A two page document by the American Academy of Allergies, Asthma & Immunology for parents.

Asthma Checklist
Asthma Education Checklist A checklist to give to your patients so they can identify questions and concerns they have about asthma.

Tracking Asthma

How to Monitor Your Peak Flow
A printable, two page handout from Intermountain Healthcare's Breathing Easier With Asthma Brochure, instructing patients (parents) on the use of the Peak Flow Meter. Includes chart for tracking Personal Best measurement over a 2-week period.

Asthma Symptoms and Peak Flow Diary

A one page document from the Asthma Initiative of Michigan for patients to keep track of symptoms for one week.

Medications

Quick Relief vs Controller Medication
The Utah Asthma Task Force offers a very simple, one page, handout describing quick relief vs controller medication. No specific mediations or medication categories are covered.

Understanding Asthma Medications
A one page handout from the Asthma Initiative of Michigan that explains relief vs controller medications, discusses categories and references generic and brand-named medications.

How to Use a Nebulizer
The Utah Asthma Task Force offers a one page handout instructing parents how to use and care for a nebulizer; includes a drawing which identifies the parts. (Spanish version)

How to Use a Metered Dose Inhaler
The Utah Asthma Task Force offers a one page instruction handout to teach parents/ patients how to use a metered dose inhaler. Includes drawings. (Spanish version)

Controlling Triggers

Asthma Triggers
A three page document from the Asthma Initiative of Michigan Website for patients and families.

Asthma Self Assessment Tool
A two page document from the Arizona Asthma Coalition website for patients.

10 Steps to Making Your Home Asthma Friendly
A one page handout for parents and families from the Utah Asthma Task Force and the Environmental Protection Agency. (Spanish version)

Asthma and Exercise
A one page handout from the Asthma Initiative of Michigan reviewing symptoms during exercise, exercise-induced asthma, and common control measures including medications.

Anticipating an Emergency

Warning Signs and Symptoms
A one page document from the Asthma Initiative of Michigan Website for patients, families, and care providers.

What is Anaphylaxis?
A two page document by the American Academy of Allergy, Asthma & Immunology for parents, care providers.

Additional Concerns

Growth and Asthma Quick Facts
A one page document from the Asthma Initiative of Michigan website for parents.

What is a Pediatric Allergist / Immunologist?
A one page document by the American Academy of Pediatrics for parents.
Asthma Education Programs in Utah

Controlling Asthma Triggers

Key Points

- The keys to trigger management are identification, avoidance and limiting exposure.
- Parents are a resource to monitor indoor and outdoor allergens.

Environmental Triggers

The keys to trigger management are:

- identification
- avoidance
- limiting exposure

Indoor Allergens May want to ask parents to fill out the EPA's home environment checklist. Included in the patient education section of this manual.

- cover mattresses and pillows with dust-proof zipped covers
- wash linens and blankets at least once a week in hot water
- control moisture to avoid mold and mildew
- regularly dust with a damp cloth and vacuum carpets and upholstered furniture
- avoid smoking in the home, See Secondhand Smoke and Asthma Fact Sheet in Patient Education.
- keep pets outdoors if possible
- control for pests (especially cockroaches)

Outdoor Allergens Teach the parents to:

- Monitor pollen counts
- Monitor daily local weather forecasts
- Keep relatively constant temperature and humidity in the home
- Keep windows closed and use air conditioning when pollen, smog, and humidity is high

To learn more about triggers in the environment see the following resources.

Triggers in the environment

Air Quality Index (AQI)
This is a cross-agency US government website that explains the Air Quality Index See in Patient (AQI) and links to numerous resources for professionals, teachers, and kids. Education It includes a fun online site for kids to learn about and check up on their local air quality.
www.airnow.gov/index.cfm?action=static.aqi

Secondhand Smoke and Asthma Fact Sheet
A handout from the Utah Asthma Task Force.
A webpage by the Utah Tobacco Prevention Control Program for parents and families. www.tobaccofreeutah.org/abcs_of_ets.htm
Additional resources related to secondhand smoke Need hard copies

Special Considerations

Key Points

- Many children with asthma also have allergies.
- Because children spend a significant portion of their day at school, it is important to communicate to the school nurse, his/her teachers, and other pertinent staff about the child's asthma.

Allergies

Many children with asthma have unrecognized allergy;
70-90% of children with asthma have allergy by positive skin test.

Allergy and Asthma Survival Guide
a website by the American Academy of Allergy Asthma and Immunology with multiple links to topics relating to asthma and allergies
www.aaaai.org/springallergy/understang_allergic_asthma.stm

The Link Between Allergies and Asthma
A webpage from the Mayo Clinic discussing the link between allergies and asthma for parents, patients, families.
www.mayoclinic.com/health/allergies_and_asthma/AA00045/MOTT=D500021

How to Help Your Child with Allergies and Asthma
A two page document by the American Academy of Allergies, Asthma & Immunology for parents.

Allergy Medications
A webpage from the Mayo Clinic website listing allergy medications by category with links to detailed information about each medication.
www.mayoclinic.com/health/allergy_medications/AA00054

Allergic Rhinitis
A handout from the American Academy of Allergy, Asthma and Immunology explaining allergic rhinitis to parents, patients, families.

Asthma Patients in a School Setting

Asthma is the single most common cause for missed school days.
Ask the student and parents about school attendance and participation in physical activities. School nurses, faculty, and staff need to be aware of each student that has asthma, in order to ensure the safety of a child with asthma there are many tools that should be used in the school setting. The following is a list of resources found in the Patient education section of this manual and links to other resources that will ensure asthma management in the school setting.

Patient Action Plan

Utah School Asthma Action Plan
From the Utah Department of Health, one page describing the three zones of symptoms and the appropriate action in the school setting. Requires signature of physician, parent, teacher, and school nurse. (in Spanish

Is the Action Plan Working? A Tool for School Nurses

Asthma attack warning signs

Utah School Asthma Emergency Protocol
From the Utah Department of Health Asthma Protocol for school personnel (in Spanish)

Medication Self-Administration Form
Form for Self-Administration of Asthma Medications in School
A one page document by the Utah Department of Health for physicians to fill out. It gives a student permission to self administer inhaled asthma medications.

When Should Students Carry Emergency Medications to School?

Preventing exercise-induced asthma

Winning with Asthma
An excellent thirty minute educational video clip for coaches at all levels to improve their understanding of asthma and to train them how to help their athletes who suffer from asthma. Requires downloading Flash Player 8.
www.winningwithasthma.org/

Exercise Induced Asthma: A Guide for Physical Educators, Coaches, and Trainers
A handout from the National Heart Lung and Blood Institute for physical educators, coaches and trainers entitled "Breathing difficulties related to physical activity for students with asthma."

Asthma and School Resources Strategies for Administrators
A website by the National Educational Association Health Information Network for school administrators working with grades K-12 to coordinate an approach to address asthma.
www.asthmaandschools.org/index.htm

Addressing Asthma in Schools
From the Centers for Disease Control and Prevention/Division of Adolescent and School Health for school administrators and school personnel
www.cdc.gov/healthyYouth/asthma/pdf/asthma/asthma.pdf

Utah Asthma School Resource Manual
www.health.utah.gov/asthma/PDF%20files/scholl%20Manual.pdf

Asthma Fact Sheet for Schools

Air Quality

Air Quality Tool Kit for Schools
A website from the Environmental Protection Agency where you can order the IAQ Tools for Schools Kits or select individual pdf files to download.

Utah School Guide for Interpreting the Air Quality Index
A handout from the Utah Department of Health Asthma Project for school personnel to determine indoor/outdoor physical activities

Frequently Asked Questions

Is asthma contagious?
No, asthma is not a contagious disease, no one can catch it from you.

What are the most common causes of asthma attacks?
The most common causes are allergies to things like dust mites or pet dander, infections like colds and flu, and irritants like smoke or breathing cold air. Many people have symptoms after exercise. Things that bother one person's airways may not bother another person.

Are asthma medicines addictive?
No, the medicines used for asthma are not addictive. Be sure to take your medicines as directed and let your doctor know if you are having trouble taking your medicines.

Do asthma medicines lose their effect if they are taken for a long time?
No, your asthma medicine will not become less effective over time. Your doctor may adjust or change your medicines if your asthma symptoms change over time.

Are inhaled steroids dangerous?
The inhaled steroid medicines use to treat asthma are safe and effective. It is important to take your steroid medicine exactly as prescribed by your doctor. The steroids used for asthma are NOT the same drug as the unsafe steroids some athletes take to build muscle.

What can I do if exercise causes my asthma symptoms?
Talk to your doctor about how to prevent asthma caused by exercise. Many people take medication before exercising. You can also learn how to pace yourself. If you asthma is under control, you should be able to take part in any activity you choose. Many Olympic athletes have asthma.

Will allergy shots help my asthma?
You will need to have allergy tests first. Allergy shots can help with certain allergies like pollen and grasses. You should also find out what you can do to avoid the things that you are allergic to.

My child has a lot of chest colds with coughing. Could he have asthma?
Talk to your child's doctor about the colds and coughing. Some children who have a lot of colds with coughing, especially at night, do have asthma and should be treated for it.

What is a peak flow meter?
Peak flow meters are most helpful for people with moderate or severe asthma. It is a device you can easily use at home to check how open your airways are and to keep track of how well your asthma is controlled. You use it by taking a deep breath and blowing hard into a plastic piece that goes in your mouth, writing down the number that appears on the meter. Your doctor may ask you to use and record you peak flow measure regularly

Do babies who have wheezing when they have a cold ever "outgrow" their asthma?
Many children who have wheezing as a baby do not go on to have asthma as they get older. But other children continue to have asthma throughout their childhood. Children with allergies or a family history of asthma are more likely to continue having asthma as they get older.

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